

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Office of Earthquake Studies

PROCEEDINGS OF
CONFERENCE VIII
ANALYSIS OF ACTUAL FAULT ZONES IN BEDROCK

Convened Under Auspices of
NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

1-5 April, 1979



OPEN-FILE REPORT 79-1239

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Menlo Park, California

1979

CONFERENCES TO DATE

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|-----------------|--|
| Conference I | Abnormal Animal Behavior Prior to Earthquakes, I |
| Conference II | Experimental Studies of Rock Friction with
Application to Earthquake Prediction |
| Conference III | Fault Mechanics and Its Relation to Earthquake
Prediction |
| Conference IV | Use of Volunteers in the Earthquake Hazards
Reduction Program |
| Conference V | Communicating Earthquake Hazard Reduction Information |
| Conference VI | Methodology for Identifying Seismic Gaps and Soon-To
Break Gaps |
| Conference VII | Stress and Strain Measurements Related to Earthquake
Prediction |
| Conference VIII | Analysis of Actual Fault Zones in Bedrock |

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PREFACE

R. C. Speed
R. V. Sharp

A potential avenue of earthquake research that seems little explored except for the work of one or two individuals is the geologic analysis of actual fault zones to assess the geometry, motions, conditions, mechanisms, and dynamics of the faulting process. In particular, how do these aspects vary with depth and do faults preserve some record of seismic failure at focal depths? Is it possible to construct a generalized global model of depthwise properties of major fault zones in the upper lithosphere? The idea behind the Palm Springs conference was the question whether worldwide observations of active and ancient faults, now exposed in mines and at the surface by erosion, could reveal a set of common depthwise characteristics that could be synthesized into a general model.

The conference, therefore, brought together **25** scientists, chiefly observationalists, who have studied faults at varied exposure depths and employed different interpretive techniques. From these proceedings, the state of the art in understanding the properties of real fault zones may become clearer than was previously possible, and the feasibility of developing a fault model may be established. Because of time limitations, an attempt to develop a consensus fault model was not made at the conference.

The papers fall into two broad topical divisions:

1. Architecture and kinematics of fault zones: geometry of the region of failure; evolution of the larger structures of the zone; distributions of discrete slip and continuum deformation; fracture patterns; effects of lateral heterogeneities; contrasts in the character of the brittle and ductile regions and the nature of the transitional zone.

2. Conditions, mechanisms, and products of faulting: fault rocks and fine structure; origin and significance of cataclasite, mylonite, and pseudo-tachylite; fault plane and faulting-induced wallrock structures in brittle and ductile zones; interpretations from actual fault zones (in the light of experiments and theory) of mineral and failure mechanisms at various depth levels/rheologic zones; failure criteria in brittle and ductile zones and possible interactions between zones; thermal regime; existence and role of pore fluids; retention of fluids; stress differences at failure.